

SIX NEW SPECIES OF *DIPLOCENTRUS* PETERS FROM CENTRAL AMERICA (SCORPIONES, DIPLOCENTRIDAE)

Scott A. Stockwell

Department of Entomological Sciences
University of California, Berkeley
Berkeley, California 94720 USA

ABSTRACT

Six new species of *Diplocentrus* Peters, 1862 (*D. lucidus* and *D. ornatus* from Belize, *D. coddingtoni*, *D. lourencoi*, and *D. santiagoi* from Honduras, and *D. steeleae* from México) are described. Notes clarifying the composition and distribution of this genus are also given.

INTRODUCTION

The diplocentrid scorpiofauna of Central America (defined as the area of land between the Isthmus of Tehuantepec and the Isthmus of Panamá) is very poorly known. Two genera occur in this region, and are often confused. *Didymocentrus* Kraepelin 1905 is known from six species in the Caribbean (Francke 1978) and three species from El Salvador, southern Honduras, Nicaragua (Kraus 1955; Francke 1978; Lourenço 1983), and Costa Rica (Francke and Stockwell 1987). Four species, *Didymocentrus caboensis* Stahnke, 1968, *Didymocentrus cerralvensis* (Stahnke, 1968), *Didymocentrus comondae* (Stahnke, 1968), and *Didymocentrus cruzensis* (Stahnke, 1968), listed by Stahnke (1968), Williams and Lee (1975), and Williams (1980) from Baja California Sur, México are problematic in their morphological characters and geographic distribution. These species possess a pedipalp chela external carinal structure similar to that of other *Didymocentrus*, in which the external and/or dorsal secondary carina is more prominent than the digital carina (a synapomorphy). They lack the oblique ventromedian keel found on the pedipalp chela and the elongation of the distal lamella found on the hemispermatophores of other *Didymocentrus*. In other respects, e.g., pedipalp chela rugosity, features of the carapace, metasoma, and legs, these species resemble *Didymocentrus*. A detailed study of the morphology and behavior of these species may help to determine their phylogenetic affinities, but for now it seems appropriate to retain them in the genus *Didymocentrus*.

The genus *Diplocentrus* Peters, 1862 is known from Texas, New Mexico, and Arizona in the United States, most of mainland México, Belize, Guatemala, and northern Honduras. Based upon the morphology of the subaculear tubercle (granular), the metasoma (dorsoventrally compressed), and pedipalp chela, two species described from Venezuela, *Diplocentrus flavus* Gonzalez-Sponga, 1983 and *Diplocentrus yustizi* Gonzalez-Sponga, 1983 clearly belong in the genus *Tarsoporosus* Francke, 1978 (= *T. flavus*, and *T. yustizi*, respectively). In addition,

Gonzalez-Sponga (1983) erroneously transferred *Tarsoporosus kugleri* (Schnecken, 1932) to *Diplocentrus*. This species should likewise be placed back in the genus *Tarsoporosus*.

The great diversity and local species richness of *Diplocentrus* has been demonstrated by Francke (1977a) for Oaxacan species. Specimens that I have examined indicate that *Diplocentrus* is at least as diverse in Central America. Unfortunately, the secretive habits of the scorpions, the lack of recent collecting efforts, the inaccessibility of some of the collecting areas, and the scarcity of adults among collected specimens has significantly hampered efforts to describe this diversity. A collecting trip to Belize by the author netted but a handful of specimens of *D. maya*, only one of which was a teneral adult male. Without a concerted effort to obtain good series of specimens from Central America, the state of this genus may remain in confusion for some time.

Species of *Diplocentrus* known to occur in Central America (Francke 1977b) include *Diplocentrus anophthalmus* Francke, 1977, *Diplocentrus mitchelli* Francke, 1977, and *Diplocentrus reddelli* Francke, 1977 from México, *Diplocentrus maya* Francke, 1977 from Belize and Guatemala, and *Diplocentrus taibeli* (Caporiacco, 1938) from Guatemala. In this paper, six new species of *Diplocentrus* are described from Belize, Honduras, and México. Although these species are described from one or a few examples, they are distinct enough (as are most species of *Diplocentrus*) to be easily recognized as different species. In fact, twice as many new species were evident to me, but several were represented by juveniles or incomplete specimens, which were unsuitable for use as types. This problem was also encountered by Francke (1977b). Describing these species will increase our knowledge of scorpions in general and might stimulate interest in collecting and studying scorpions from Central America.

METHODS

Measurements and terminology follow Stahnke (1970), except for trichobothriotaxia, which follows Vachon (1974), metasomal and pedipalpal carination, which follows Francke (1978), and hemispermatophore terminology which follows Lamoral (1979). Hemispermatophores were observed in 100% clove oil or lactophenol. All measurements and drawings were made using a dissecting microscope equipped with an ocular micrometer and a drawing tube.

Genus *Diplocentrus* Peters, 1862

Diagnosis.—Pedipalp chela with digital carina always more prominent than dorsal secondary or external secondary carinae; ventral face of chela arched, not flat, with ventromedian carina usually directed distally between the movable finger condyles; surface of chela with reticulate costate pattern, punctation weak to obsolete; base of movable finger of chela opposing fixed finger without a cluster of small tubercles; pedipalp femur width/depth variable. Carapace never noticeably punctate, two or three pairs of lateral eyes present; prolateral pedal spurs present, tarsomere II with or without laterodistal lobes; metasomal segment V with ventral transverse carina; subaculear tubercle not granular. Distal lamella

of hemispermatophore not more than 1.5 times longer than trunk; external lateral margin of median lobe crenulate to strongly denticulate.

Comparisons.—This genus differs from others in the family Diplocentridae (and most Scorpionidae) by the absence of a cluster of small tubercles at the base of the primary row of denticles on the movable finger (an autapomorphy). It differs from *Heteronebo* Pocock, 1899 and *Nebo* Simon, 1878 by the presence of a ventral transverse carina on metasomal segment V. *Diplocentrus* differs from *Cazierius* Francke, 1978, *Oiclus* Simon, 1880, and *Tarsoporosus* Francke, 1978 by having the ventral face of the pedipalp chela arched rather than flat. *Didymocentrus* differs from *Diplocentrus* by having the external secondary or dorsal secondary carinae of the pedipalp chela more prominent than the digital carina and by lacking a reticulate costate pattern on the pedipalps. Most *Didymocentrus* (except Baja California species) also have the ventromedian carina of the pedipalp chela directed toward the internal movable finger condyle, and have the distal lamella of the hemispermatophore more than twice the length of the trunk. *Diplocentrus tehuano* Francke, 1977 and *D. ornatus*, however, exhibit a distinctly oblique ventromedian carina like that found in *Didymocentrus*.

Diplocentrus lucidus, new species

Figs. 1-6

Type data.—Holotype female with 28 first instar young (paratypes) from Blue Hole, Cayo District, Belize, 22 August 1982 (no collector), deposited in the University of Georgia Museum of Natural History, Athens, Georgia.

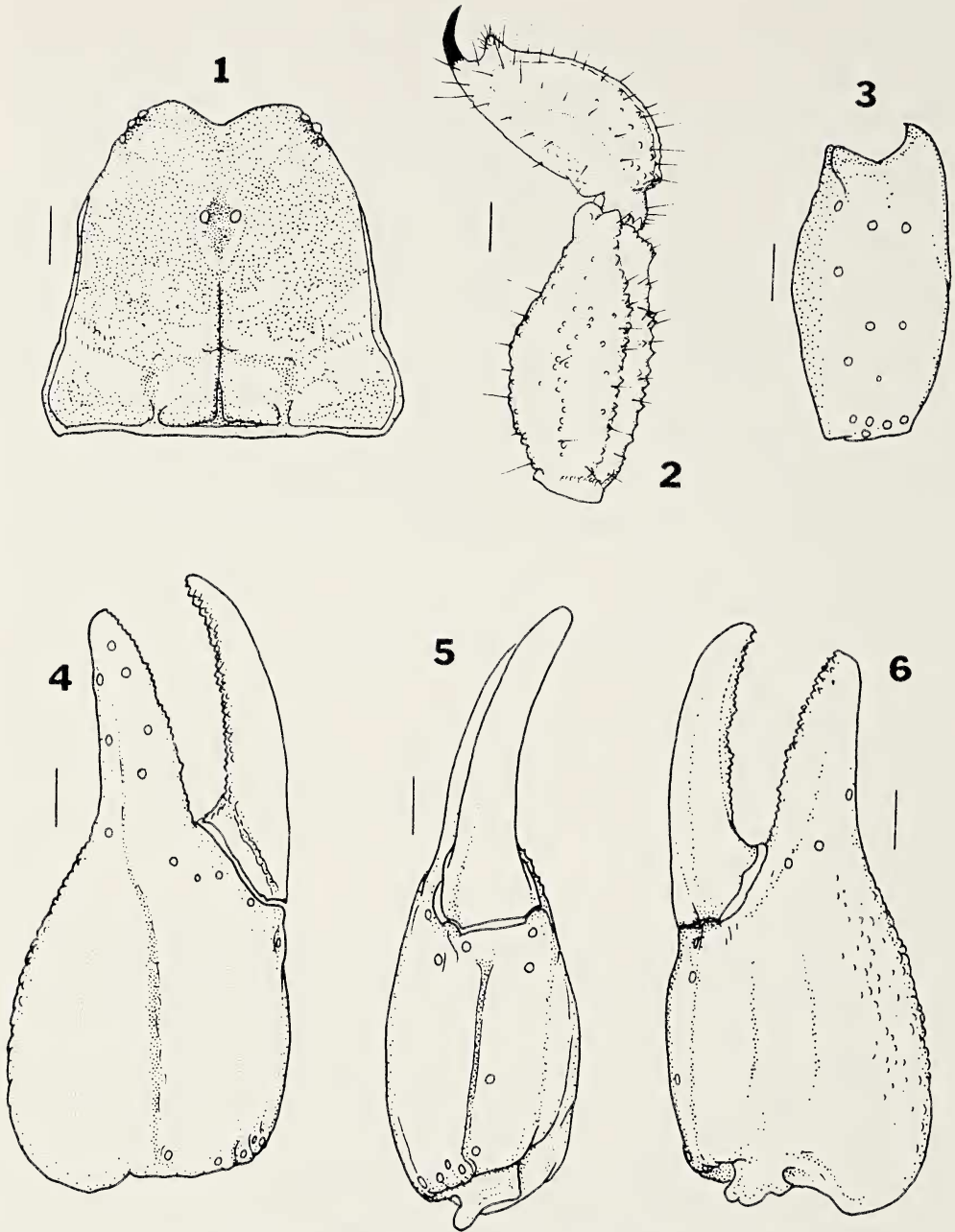
Etymology.—The specific epithet is from the Latin *lucid* and refers to the shiny appearance of this holotype.

Distribution.—Known only from the type locality.

Diagnosis.—Dark scorpion; adult female 42 mm long; carapace sparsely granular, wider than long; pectinal tooth count 11-13; genital operculi with three pairs of setae; tarsomere II spine formula 4-5/5:5-6/5-6:7/7:7/7; pedipalp chela of female smooth; pedipalp chela length/depth 2.06; pedipalp chela width/depth 0.69.

Description.—*Female*: Brown with variable dark brown marbling. Carapace minutely granular along margins, wider than long (Fig. 1); prosomal venter smooth, lustrous, sparsely punctate; pectinal tooth count 11-12. Genital operculi bearing three pairs of setae. Mesosomal tergites smooth, moderately punctate; weakly granular along the posterior margin; tergite VII granular posterolaterally, not bilobate; submedian and lateral carinae obsolete, indicated by a few large granules. Mesosomal sternites smooth, moderately punctate; sternite VII with submedian carinae vestigial, smooth; lateral carinae weak, smooth.

Metasoma intercarinal spaces granular. Dorsolateral and lateral supramedian carinae moderately strong, granulose on all segments. Lateral inframedian carinae complete on all segments; weak, granulose. Ventrolateral carinae moderate; finely granulose on segment I; smooth on II; subgranulose on III; granulose on IV. Ventral submedian carinae weak, smooth on segments I and II; obsolete, granular on III and IV. Metasomal segment V (Fig. 2) with dorsolateral carinae strong, granular; lateromedian carinae present on anterior one-half, weak, granular;



Figs. 1-6.—*Diplocentrus lucidus*, new species, holotype female: 1, carapace; 2, metasomal segment V and telson, lateral aspect; 3-6, pedipalp; 3, patella, external aspect; 4, chela, external aspect; 5, chela, ventral aspect; 6, chela, internal aspect. Scale bars = 1 mm.

ventrolateral and ventromedian carinae strong, tuberculate; ventral transverse carina weak, tuberculate; anal subterminal carina strong, crenulate; terminal carina obsolete. Telson (Fig. 2) smooth with a row of tubercles on the ventral anterior surface; moderately setose.

Pedipalps with orthobothriotaxy C (Vachon 1973). Femur with dorsal and internal faces granular; other faces smooth; dorsointernal carina weak to

moderate, granulose; dorsoexternal carina moderate, granulose; ventroexternal carina obsolete; ventrointernal carina weak to moderate, granulose. Patella (Fig. 3) with ventral and external faces smooth; internal face minutely granular; basal tubercle weak, granulose; dorsomedian carina moderately strong, smooth; ventroexternal carina weak, smooth; ventrointernal carina moderate, granulose; other carinae obsolete. Chela (Figs. 4-6) with external, ventral, and internal faces smooth; dorsal marginal carina vestigial, granular; digital carina weak to moderate, smooth; ventromedian carina moderately strong, smooth; ventrointernal carina weak, smooth; all internal carinae weak, smooth to weakly granular. All other carinae vestigial to obsolete, smooth.

Legs with tarsomeres weakly granular, other segments smooth. Tarsomere II spine formula 4-5/5-6/5-6:7/7:7/7.

Morphometrics.—Carapace wider than long; metasomal segments I and II wider than long. Pedipalp chela length/depth 2.06; pedipalp chela width/depth 0.69; pedipalp chela length/pedipalp fixed finger length 2.51; pedipalp chela length/carapace length 1.65; carapace length/pedipalp fixed finger length 1.53; pedipalp fixed finger length/pedipalp femur length 0.87; pedipalp fixed finger length/metasomal segment V length 0.76.

Variation.—Pectinal teeth were counted on 28 first instar young captured with the holotype. Although they cannot be reliably sexed before the third instar, both males and females are likely to be represented in this litter. Specimens varied in pectinal tooth counts as follows: 23 combs with 11 teeth; 31 combs with 12 teeth; 4 combs with 13 teeth. Other taxonomically important structures were not sufficiently developed to be of use in this description.

Comparisons.—This species may be distinguished from *D. taibeli*, *D. mitchelli*, *D. lourencoi*, and *D. santiagoi* by its smaller size and lower number of setae on the genital operculi (three pairs versus six to ten pairs). It may be distinguished from the remaining Central American *Diplocentrus* by having the carapace wider than long (all others with carapace longer than wide) and by its high tarsomere II spine formula.

Specimens examined.—Known only from the holotype and its young.

Diplocentrus ornatus, new species

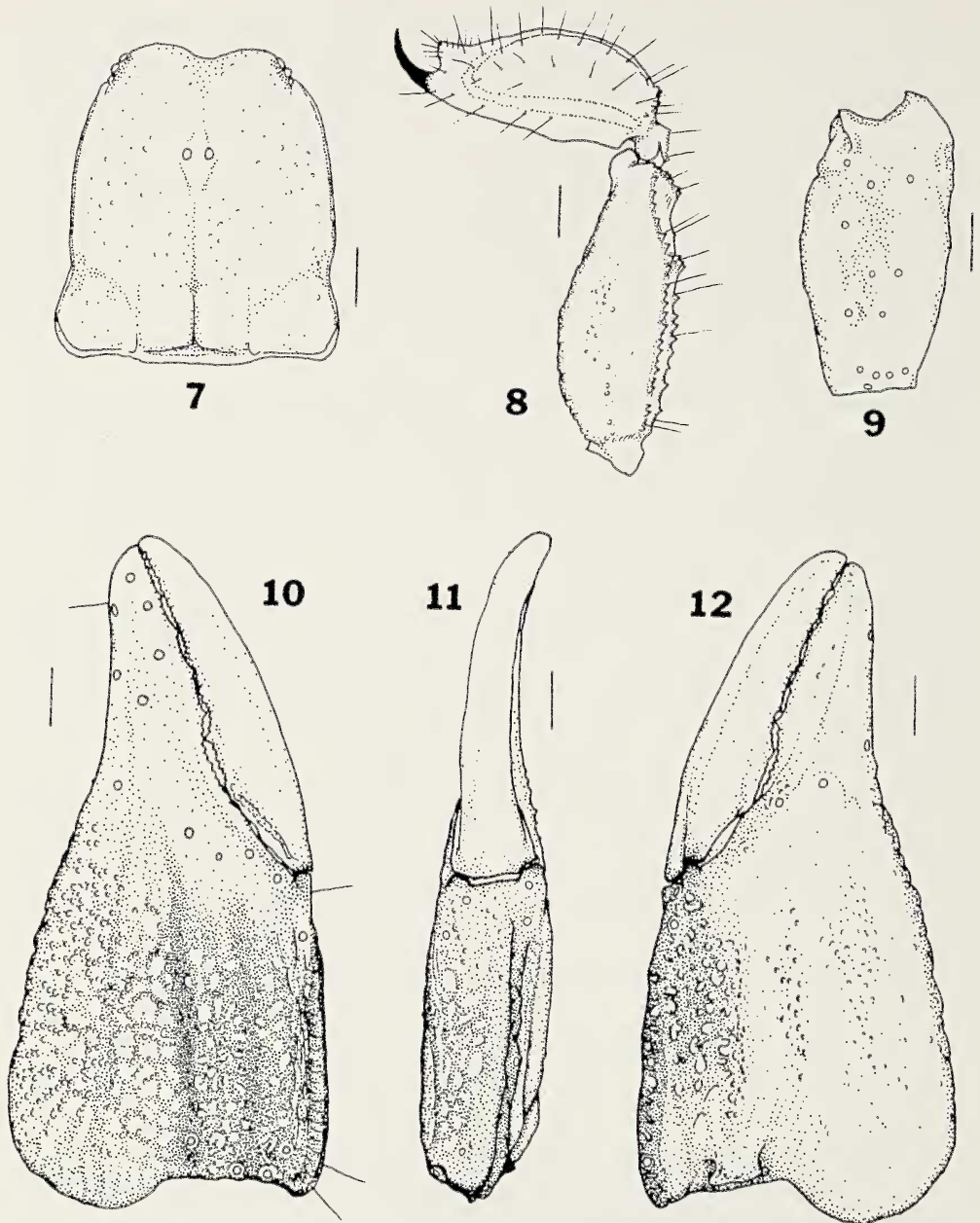
Figs. 7-18

Type data.—Holotype male and two female paratypes from Bokowina, Stann Creek District, Belize, 21 October 1939 (I. T. Sanderson), deposited in the Field Museum of Natural History, Chicago.

Etymology.—The specific epithet is from the Latin *ornat* and refers to the delicately sculptured pedipalps of the male of this species.

Distribution.—Known only from the type locality.

Diagnosis.—Reddish scorpions; adults 30 to 38 mm long; carapace moderately granular, much longer than wide; pectinal tooth counts 10-11 in males, 10 in females; genital operculi with two or three pairs of setae; modal tarsomere II spine formula 4/4:5/5:6/6:6/6; males with weak to moderate reticulate costate pattern on pedipalp, female pedipalp with vestigial reticulation; pedipalp chela length/depth 2.16 in male, 2.13-2.15 in females; pedipalp chela width/depth 0.43 in male, 0.59-0.60 in females.



Figs. 7-12.—*Diplocentrus ornatus*, new species, holotype male: 7, carapace; 8, metasomal segment V and telson, lateral aspect; 9-12, pedipalp; 9, patella, external aspect; 10, chela, external aspect; 11, chela, ventral aspect; 12, chela, internal aspect. Scale bars = 1 mm.

Description.—*Male*: Color light reddish brown without dark brown marbling. Carapace moderately granular, much longer than wide (Fig. 7); prosomal venter smooth, weakly punctate; pectinal tooth count 10-11. Genital operculi bearing two or three pairs of setae. Mesosomal tergites densely granular; tergite VII moderately bilobate, coarsely granular; submedian and lateral carinae obsolete. Mesosomal sternites coriaceous, weakly punctate; sternite VII with submedian carinae obsolete; lateral carinae vestigial, subgranulose.

Metasoma intercarinal spaces weakly granular. Dorsolateral carinae weak, sparsely granulose on segments I-IV. Lateral supramedian carinae weak, granulose on segments I-IV. Lateral inframedian carinae interrupted, vestigial to obsolete, weakly granulose on segments I-IV. Ventrolateral carinae weak, smooth on segments I-III; moderate, weakly granulose on IV. Ventral submedian carinae weak to vestigial, smooth on segments I and II; obsolete on III and IV. Metasomal segment V (Fig. 8) dorsolateral carinae weak to moderate, granulose; lateromedian carinae obsolete, represented by a line of small, scattered granules; ventrolateral carinae moderate, sharply granulose; ventromedian carina weak to moderate, sparsely granular; ventral transverse carina moderate, tuberculate; anal subterminal carina moderate, sparsely crenulate; anal terminal carina obsolete. Telson (Fig. 8) smooth, weakly granulose along anteroventral face; moderately setose.

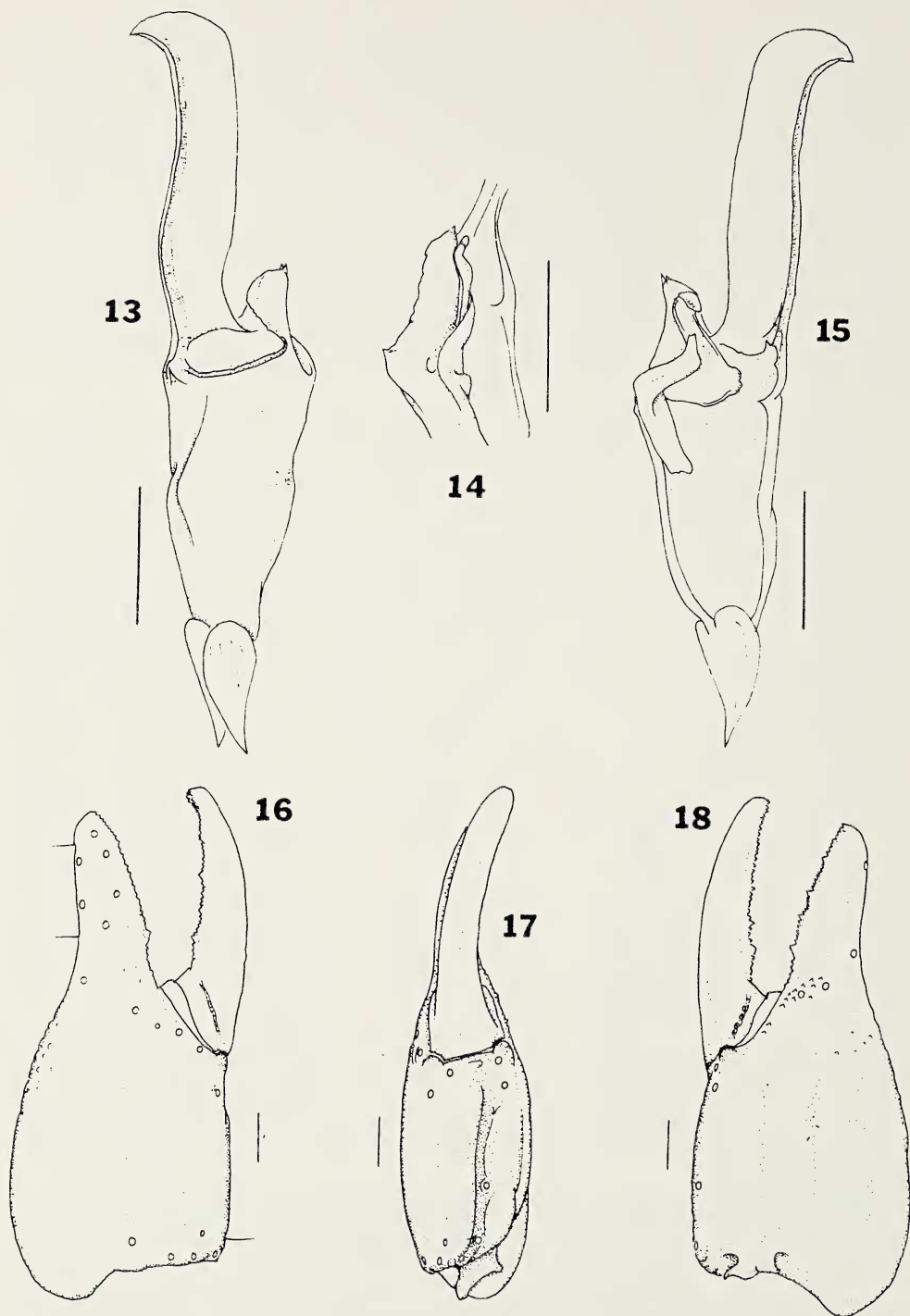
Pedipalps with orthobothriotaxy C (Vachon 1973). Femur with dorsal and internal faces very sparsely granular, interspersed with small tubercles; ventral and external faces sparsely, minutely granular; dorsointernal, dorsoexternal, and ventrointernal carinae weak, variably tuberculate; ventroexternal carina obsolete. Patella (Fig. 9) with ventral and external faces smooth; internal face granular; basal tubercle moderate with one or two hook-like denticles; dorsomedian carina moderate, smooth; ventroexternal carina weak to vestigial, smooth; ventrointernal carina weak, granulose; other carinae obsolete. Chela laterally compressed (Figs. 10-12) with dorsal, ventral, and external faces weakly to moderately reticulate; internal face vestigially reticulate; dorsal marginal carina moderate, granulose; dorsal secondary carina vestigial, smooth; digital carina moderate, smooth; external secondary carina vestigial, reticulate; ventroexternal carina weak, reticulate; ventromedian carina very strong, directed distally toward internal movable finger condyle, produced into a flange extending proximally along basal margin of chela to digital carina; ventrointernal carina obsolete; internal carinae vestigial to obsolete.

Legs sparsely granular. Tarsomere II spine formula 4/4:5/5:6/6:6/6.

Hemispermaphore (Figs. 13-15) lamelliform; lateral external margin of median lobe armed with several low, rounded denticles; inner lobe bearing a distal projection along the ventral margin.

Females differ from male as follows. Carapace and mesosomal tergites weakly, sparsely granular; pedipalps and metasoma less granular. Pedipalp chela (Figs. 16-18) with all faces vestigially reticulate to smooth, dorsal face granular; dorsal marginal, dorsal secondary, digital, secondary dorsal, and internal carinae vestigial; ventromedian carina moderate to strong; all other carinae obsolete. Pectinal tooth count 10.

Morphometrics.—Carapace longer than wide; pedipalps elongate, those of male larger than those of female; all metasomal segments longer than wide in male; metasomal segment I wider than long in females. Pedipalp chela length/depth 2.16 in male, 2.13-2.15 in females; pedipalp chela width/depth 0.43 in male, 0.59-0.60 in females; pedipalp chela length/pedipalp fixed finger length 2.49 in male, 2.46-2.52 in females; pedipalp chela length/carapace length 1.94 in male, 1.72-1.74 in females; carapace length/pedipalp fixed finger length 1.28 in male, 1.44-1.45 in females; pedipalp fixed finger length/pedipalp femur length 0.98 in male, 0.93 in females; pedipalp fixed finger length/metasomal segment V length 0.80 in male, 0.81-0.82 in females.



Figs. 13-18.—*Diplocentrus ornatus*, new species: 13-15, right hemispermatophore of holotype male; 13, dorsal aspect; 14, detail of capsular region, ectal aspect; 15, ventral aspect; 16-18, right pedipalp chela of female; 16, external aspect; 17, ventral aspect; 18, internal aspect. Scale bars = 1 mm.

Variation.—Specimens varied in pectinal tooth counts as follows: male, one comb with ten teeth, one comb with 11 teeth; females, four combs with ten teeth. Tarsomere II spine counts differed from the typical formula as follows: two leg I's with 4/5; one leg II with 4/5; one leg III with 5/6; one leg III with 6/7; one leg IV with 6/7.

Habitat.—The three type specimens were collected "in a hole in moist loam."

Comparisons.—*Diplocentrus ornatus* can be distinguished from *D. taibeli*, *D. mitchelli*, *D. lourencoi*, and *D. santiagoi* by its smaller size and lower number of setae on the genital operculi (two to three pairs versus six to ten pairs). This species differs from *D. lucidus*, *D. reddelli*, *D. maya*, *D. anophthalmus*, and *D. coddingtoni* by its lower pedipalp chela width/depth (less than or equal to 0.60 versus greater than 0.60), the absence of dusky marbling on the carapace, and the position of the ventromedian carina of the pedipalp chela (directed toward the movable finger inner condyle rather than medially between the inner and outer condyle). *Diplocentrus ornatus* differs from its close relative *D. steeleae*, by its larger size, its greater pedipalp chela length/depth (greater than 2.00 versus less than 2.00), and its hemispermatophore (lateral external margin of median lobe weakly dentate in *D. ornatus*, strongly dentate in *D. steeleae*).

Specimens examined.—Known only from the holotype and two paratypes.

Diplocentrus lourencoi, new species

Figs. 19-24

Type data.—Holotype female from Río Santa Ana Canyon (3500 ft.), San Pedro Sula, Departamento Cortés, Honduras, 21 March 1923 (K. Schmidt and L. Walters), Capt. Field Mus. Exped., deposited in the Field Museum of Natural History, Chicago.

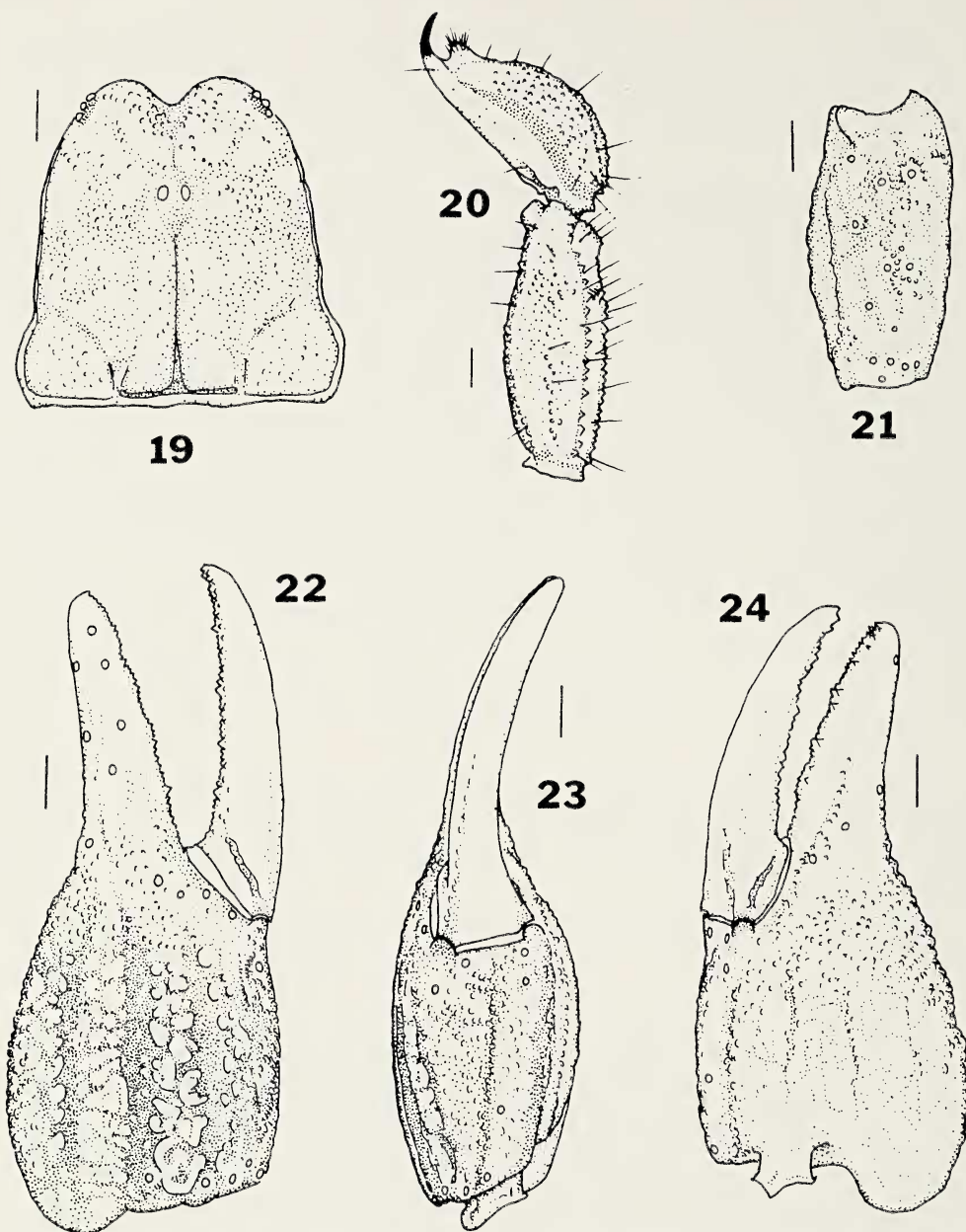
Etymology.—The specific epithet honors fellow scorpionologist Dr. Wilson R. Lourenço, in recognition of his contributions to scorpion systematics, biogeography, and biology.

Distribution.—Known only from the type locality.

Diagnosis.—Dark scorpion; 50 mm in total length; carapace densely, coarsely granular, wider than long; pectinal tooth count 9-10 in females, males unknown; genital operculi with eight to ten pairs of setae; modal tarsomere II spine formula 4/5:5/5:5/6:5/6; female pedipalp with weak reticulation; pedipalp somewhat elongate; pedipalp chela length/depth 2.29; pedipalp chela width/depth 0.66.

Description.—*Female*: Color brown with variable dark brown marbling. Carapace densely, coarsely granular, posterior width greater than length (Fig. 19); prosomal venter coriaceous, punctate; pectinal tooth count 9-10. Genital operculi bearing eight to ten pairs of setae. Mesosomal tergites minutely granular; tergite VII not bilobate, acarinate. Mesosomal sternites smooth to coriaceous, punctate; sternite VII submedian carinae vestigial, smooth; lateral carinae weak, smooth.

Metasoma intercarinal spaces coarsely granular. Dorsolateral carinae moderate, granular on segments I-IV. Lateral suprmedian carinae moderate, granular on segments I-IV. Lateral inframedian carinae granular; weak, complete on segments I-III; vestigial, incomplete on IV. Ventrolateral carinae moderate, granulose on segments I-IV. Ventral submedian carinae granular; weak on segments I and II; vestigial on III; obsolete on IV. Metasomal segment V (Fig. 20) dorsolateral



Figs. 19-24.—*Diplocentrus lourencoi*, new species, holotype female: 19, carapace; 20, metasomal segment V and telson, lateral aspect; 21-24, pedipalp; 21, patella, external aspect; 22, chela, external aspect; 23, chela, ventral aspect; 24, chela, internal aspect. Scale bars = 1 mm.

carinae moderate, granular; lateromedian carinae weak, granular on anterior one-half; ventrolateral, ventromedian and ventral transverse carinae moderate to strong, tuberculate; anal subterminal carina moderate, subtuberculate; anal terminal carina weak, granulose. Telson (Fig. 20) moderately granular; sparsely hirsute.

Pedipalps with orthobothriotaxy C (Vachon 1973). Femur with dorsal and internal faces coarsely granular; ventral and external faces minutely granular;

dorsointernal and dorsoexternal carinae moderate, granular; ventrointernal carina vestigial, granular; other carinae obsolete. Patella (Fig. 21) with ventral and external faces weakly reticulate, granular; internal face coarsely granular; basal tubercle strong, granular; dorsomedian carina strong, granular; dorsoexternal carina weak, granular; ventroexternal carina weak to moderate, granular; ventrointernal carina weak, granular; other carinae obsolete. Chela (Figs. 22-24) with all faces weakly reticulate, these reticulae granular; dorsal, internal, and ventral faces, and external face at base of fixed finger granular; dorsal marginal carina vestigial, granular; dorsal secondary carina weak to vestigial, granular; digital carina weak to moderate, smooth; external secondary carinae weak to vestigial, granular; ventroexternal carina obsolete; ventromedian carina strong, granular; ventrointernal carina weak, granular; internal carinae weak, granular.

Legs minutely granular. Tarsomere II spine formula 4/5:5/5:5/6:5/6.

Morphometrics.—All metasomal segments longer than wide; carapace wider than long. Pedipalp chela length/depth 2.29; pedipalp chela width/depth 0.66; pedipalp chela length/pedipalp fixed finger length 2.27; pedipalp chela length/carapace length 1.87; carapace length/pedipalp fixed finger length 1.21; pedipalp fixed finger length/pedipalp femur length 0.98; pedipalp fixed finger length/metasomal segment V length 0.89.

Comparisons.—This species is distinguished from *D. reddelli*, *D. maya*, *D. anophthalmus*, *D. coddingtoni*, *D. lucidus*, *D. ornatus*, and *D. steeleae* by its larger size and greater number of setae on the genital operculi (eight to ten pairs versus two to four pairs). It can be separated from *D. taibeli* and *D. mitchelli* by its lower pectinal tooth counts (nine to ten versus 15-17) and the presence of weak reticulation on all pedipalp chela faces (lacking in *D. taibeli* and *D. mitchelli*). *Diplocentrus lourencoi* differs from *D. santiagoi* by its slightly lower pectinal tooth count (nine to ten versus 12), its slightly higher number of setae on the genital operculi (eight to ten pairs versus seven pairs), and the granulation of the carapace and telson (densely, coarsely granular in *D. lourencoi*, smooth to weakly granular in *D. santiagoi*).

Specimens examined.—Known only from the holotype.

Diplocentrus coddingtoni, new species

Figs. 25-36

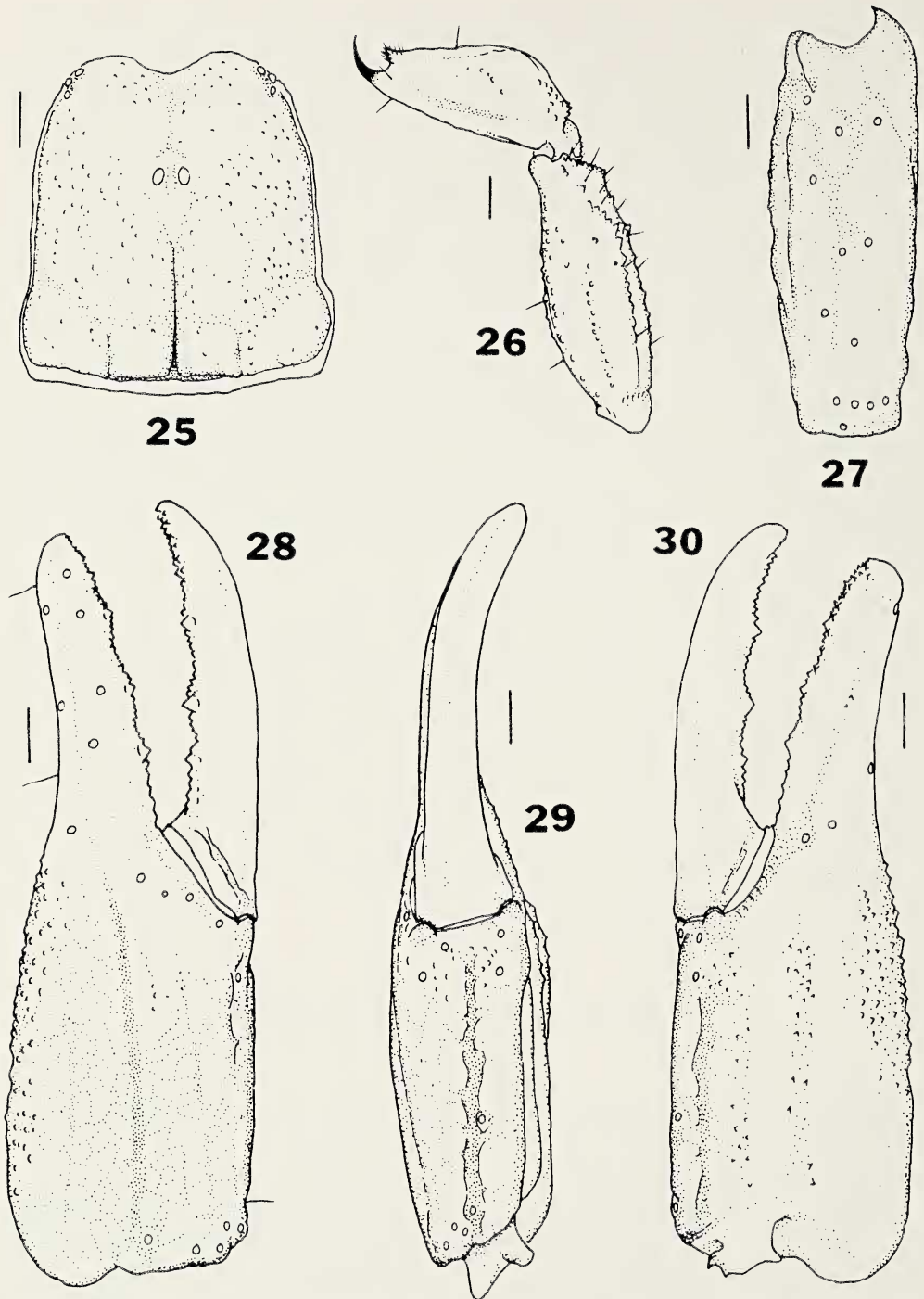
Type data.—Holotype male and paratypes from La Ceiba, Departamento Atlántida, Honduras, 1920 (W. L. Mann), deposited in the U.S. National Museum, Washington, D.C. USA.

The types were found in separate vials, some labelled "*Didymocentrus ceibaensis* Stahnke, M.S. name?, 1984?" and the others labelled "*Didymocentrus hondurensis* Stahnke, M.S. name?, 1984?," apparently by museum staff. These names were never published and are not valid. In addition, the specimens were identified to the wrong genus, and the sexes were thought to be different species.

Etymology.—Named in honor of Dr. Jonathan Coddington, Curator of Arachnida and Myriapoda, U.S. National Museum.

Distribution.—Known only from the type locality.

Diagnosis.—Dark scorpions; adults 35 to 45 mm long; carapace coarsely, minutely granular, much longer than wide; pectinal tooth counts 11 in males, 10-



Figs. 25-30.—*Diplocentrus coddingtoni*, new species, holotype male: 25, carapace; 26, metasomal segment V and telson, lateral aspect; 27-30, pedipalp; 27, patella, external aspect; 28, chela, external aspect; 29, chela, ventral aspect; 30, chela, internal aspect. Scale bars = 1 mm.

11 in females; genital operculi with two or three pairs of setae; modal tarsomere II spine formula 4/4:4/5:5/5:5/5. Males with weak reticulate costate pattern on pedipalp; female pedipalp with vestigial reticulation. Strongly sexually dimorphic; pedipalp chela length/depth 2.98 in male, 2.07-2.22 in female; pedipalp chela width/depth 0.63 in male, 0.58-0.64 in female.

Description.—*Male*: Color brown with variable dark brown marbling. Carapace coarsely, minutely granular, much longer than wide (Fig. 25); prosomal venter coriaceous to vestigially granular, very sparsely punctate; pectinal tooth count 11-11. Genital operculi bearing two to three pairs of setae. Mesosomal pretergites coriaceous; tergites shagreened, interspersed with weak granulation; tergite VII acarinate; moderately bilobed, coarsely granular posterolaterally. Mesosomal sternites sparsely, minutely granular, finely punctate; sternite VII with submedian and lateral carinae weak to vestigial, smooth.

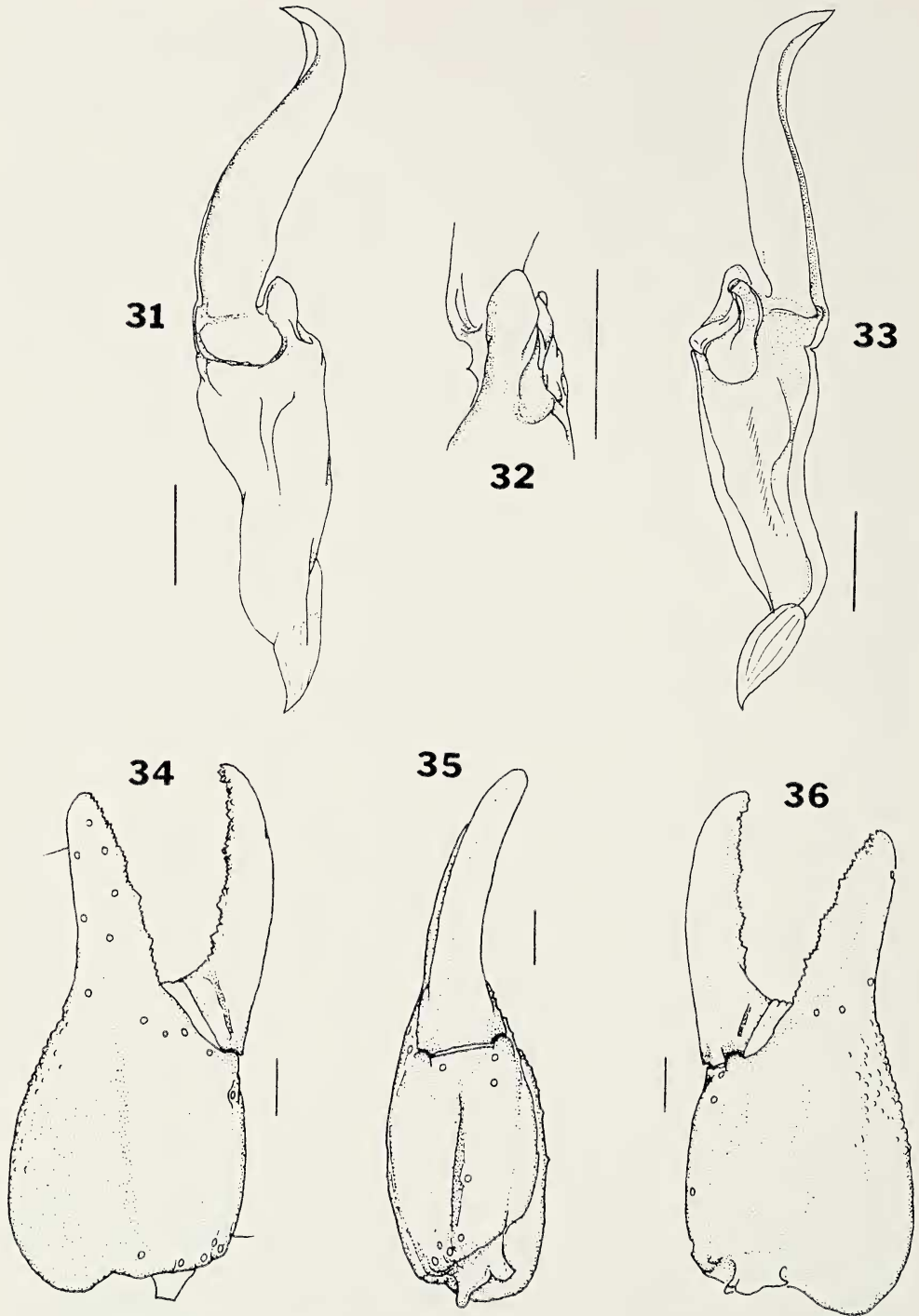
Metasoma intercarinal spaces coarsely, minutely granular dorsally, smooth ventrally. Dorsolateral carinae weak, on segment I; moderate on II, III; and strong on IV; tuberculate. Lateral suprmedian carinae moderate on segment I; strong on II-IV; sharply tuberculate. Lateral infrmedian carinae moderate on segments I-III; weak on IV; serrate to subserrate. Ventrolateral carinae moderate, smooth on segments I-IV. Ventral submedian carinae smooth, weak to moderate on segments I and II; weak on III; vestigial on IV. Metasomal segment V (Fig. 26) minutely granular on lateral, anterior dorsal, and anterior ventral faces; lateromedian areas of dorsal surface with numerous sharp granules; dorsolateral carinae moderate, irregularly granulose; lateromedian carinae vestigial, irregularly granular; ventrolateral, ventromedian and ventral transverse carinae moderate to strong each with a single row of sharp tubercles; anal subterminal carina moderate, granulose; anal terminal carina obsolete. Telson (Fig. 26) smooth, with a few tubercles on the anterior ventral surface, sparsely setose.

Pedipalps with orthobothriotaxy C (Vachon 1973). Femur with internal face moderately tuberculate; other faces minutely granular; dorsointernal carina weak to moderate with well separated large tubercles; dorsoexternal carina weak to vestigial distally, granulose; ventroexternal carina obsolete; ventrointernal carina weak to obsolete distally, tuberculate. Patella (Fig. 27) with ventral and external faces vestigially reticulate; internal face coarsely granular; basal tubercle moderately strong, bifurcate; dorsomedian carina moderate, smooth; ventroexternal carina weak to vestigial; ventrointernal carina weak, sparsely granulose; other carinae obsolete. Chela (Figs. 28-30) with dorsal face weakly reticulate; other faces lacking reticulate costate pattern; dorsal marginal carina moderate to strong, granulose; dorsal secondary carina weak, weakly reticulate; digital carina strong, smooth; external secondary carina vestigial, weakly reticulate; ventroexternal carina obsolete; ventromedian carina moderate to strong, reticulate; ventrointernal carina weak to moderate, smooth; internal carinae weak, smooth ventrally, granular dorsally. Fingers of chela noticeably thick, without taper.

Legs lustrous, carinae granular. Tarsomere II spine formula 4/4:4/5:5/5:5/5.

Hemispermaphore (Figs. 31-33) lamelliform; lateral margin of capsular lobe armed with a few weak denticles; inner lobe bearing a projection distally.

Females differ from male as follows. Carapace and tergites weakly granular; venter and sternites smooth, lustrous; sternite VII with submedian carinae vestigial. Metasomal intercarinal spaces smooth; dorsolateral carinae weak to moderate, granulose; lateral suprmedian carinae weak to moderate, granulose;



Figs. 31-36.—*Diplocentrus coddingtoni*, new species: 31-33, right hemispermaphore of holotype male; 31, dorsal aspect; 32, detail of capsular region, ectal aspect; 33, ventral aspect. 34-36, pedipalp chela of paratype female; 34, external aspect; 35, ventral aspect; 36, internal aspect. Scale bars = 1 mm.

lateral inframedian carinae weak to vestigial; ventrolateral carinae moderate to weak, weakly granulose to smooth; ventral submedian carinae weak, granulose on segments I and II, vestigial, smooth on III, obsolete on IV. Metasomal segment V less granular; dorsolateral carinae weak, subgranulose. Telson not elongate, vestigially granular. Pedipalp less granular, not elongate; chela (Figs. 34-36) vestigially reticulate dorsally; all carinae weaker, smooth; pectinal tooth count 10-11.

Morphometrics.—Sexes are strongly dimorphic in some characters. Carapace longer than broad; pedipalp greatly elongate in males; all metasomal segments longer than wide on male; metasomal segments I and II as wide as or wider than long on female. Pedipalp chela length/depth 2.98 in male, 2.07-2.22 in females; pedipalp chela width/depth 0.63 in male, 0.58-0.64 in females; pedipalp chela length/pedipalp fixed finger length 2.44 in male, 2.35-2.45 in females; pedipalp chela length/carapace length 2.08 in male, 1.66-1.78 in females; carapace length/pedipalp fixed finger length 1.17 in male, 1.32-1.45 in females; pedipalp fixed finger length/pedipalp femur length 0.78 in male, 0.89-0.98 in females; pedipalp fixed finger length/metasomal segment V length 0.87 in male, 0.84-0.89 in females.

Variation.—Paratype tarsomere II spine counts 4/4, X/X on leg II; 5/X, X/X on leg IV. Pectinal tooth counts on females varied as follows: six combs with 10 teeth, two combs with 11 teeth.

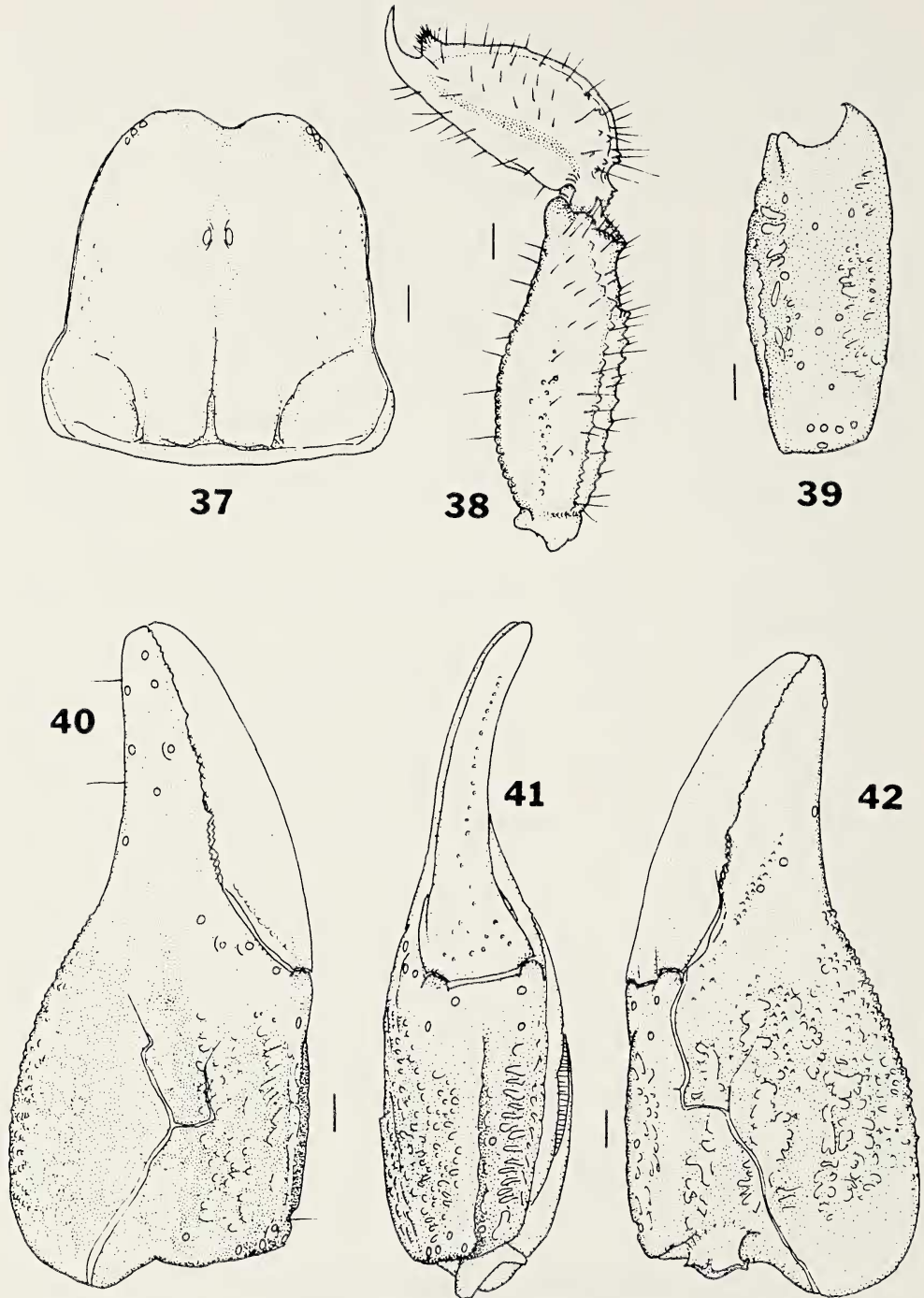
Comparisons.—This species can be distinguished from *D. taibeli*, *D. mitchelli*, *D. lourencoi*, and *D. santiagoi* by its lower number of setae on the genital operculi (two to three pairs versus six to ten pairs). *Diplocentrus coddingtoni* can be distinguished from *D. lucidus* by its narrower carapace and lower tarsomere II spine formula (4/4:4/5:5/5:5/5 versus 4-5/5:5-6/5-6:7/7:7/7). It differs from *D. ornatus* and *D. steeleae* by its greater male pedipalp chela length/depth (2.98 versus 1.93 and 2.16), male pedipalp chela width/depth (0.64 versus 0.43-0.48), and in the placement of the distal projection of the inner lobe of the hemispermatophore (along the dorsal margin in *D. coddingtoni*, along the ventral margin in *D. ornatus* and *D. steeleae*). *Diplocentrus coddingtoni* differs from *D. reddelli* and *D. maya* by its pedipalp chela length/depth (2.98 and 2.07 for male and female of *D. coddingtoni*, 2.40-2.50 and 2.27-2.42 for males and females of *D. maya*, 2.56 for male of *D. reddelli*) and the degree of granulation on the carapace (minute, coarse granulation on *D. coddingtoni* male, sparsely granulose on *D. maya* male, shagreened on *D. reddelli* male). *Diplocentrus anophthalmus* is troglobitic and differs from *D. coddingtoni* by its lack of median eyes, pigmentation, and pedipalp chelal carinae.

Specimens examined.—In addition to the holotype, four female and two juvenile male paratopotypes.

Diplocentrus santiagoi, new species

Figs. 37-42

Type data.—Holotype female from Copán, Departamento Copán, Honduras, 4 March 1939 (no collector), deposited in the American Museum of Natural History, New York.



Figs. 37-42.—*Diplocentrus santiagoi*, new species, holotype female: 37, carapace; 38, metasomal segment V and telson, lateral aspect; 39-42, pedipalp; 39, patella, external aspect; 40, chela, external aspect (note fracture); 41, chela, ventral aspect; 42, chela, internal aspect. Scale bars = 1 mm.

Etymology.—Named for my good friend and fellow scorpialogist, Jorge A. Santiago-Blay, in recognition of his contributions to scorpion taxonomy.

Distribution.—Known only from the type locality.

Diagnosis.—Dark brown scorpions; adults 60 mm long; carapace weakly granular, wider than long; genital operculi with seven pairs of setae; pectinal tooth count 12 in female, males unknown; modal tarsomere II spine formula 5/5:5/5:6/6:6/6; pedipalp of female somewhat elongate, weakly reticulate on all faces; pedipalp chela length/depth 2.17; pedipalp chela width/depth 0.63.

Description.—*Female*: Brown with variable dark brown marbling. Carapace weakly granular along the anterior and lateral margins, and along the median furrow; wider than long (Fig. 37); prosomal venter smooth, punctate; pectinal tooth count 12-12. Genital operculi bearing seven pairs of setae. Mesosomal tergites smooth; tergite VII granular; not bilobate; submedian and lateral carinae obsolete, represented by a few large granules. Mesosomal sternites smooth, densely punctate; sternite VII with submedian and lateral carinae very weak to vestigial, smooth.

Metasoma intercarinal spaces minutely granular. Dorsolateral carinae moderate, granulose on segments I-IV. Lateral suprmedian carinae moderate, granulose on segments I-IV. Lateral inframedian carinae granulose; complete, moderate on segment I, weak on II and III; incomplete, vestigial on IV. Ventrolateral carinae moderate, granulose on segments I-III; weak, crenate on IV. Ventral submedian carinae weak, subgranulose on segments I and II; vestigial, smooth on III; vestigial to obsolete, smooth on IV. Metasomal segment V (Fig. 38) dorsolateral carinae moderate, granulose; lateromedian carinae very weak, granular on anterior one-half; ventrolateral, ventromedian and ventral transverse carinae moderate to strong, tuberculate; anal subterminal carina strong, crenulate; anal terminal carina obsolete. Telson (Fig. 38) sparsely tuberculate anteroventrally, otherwise smooth.

Pedipalp with orthobothriotaxy C (Vachon 1973). Femur with dorsal and internal faces sparsely granular; other faces smooth; dorsointernal, dorsoexternal, and ventrointernal carinae weak to moderate, granular; ventroexternal carina obsolete. Patella (Fig. 39) with external face vestigially reticulate; internal face minutely granular; dorsal and ventral faces smooth; basal tubercle strong, armed with two hook-like tubercles; dorsomedian carina moderate to weak, subgranulose; ventroexternal carina weak, smooth; ventrointernal carina weak, granular; other carinae obsolete. Chela (Figs. 40-42) with all faces weakly reticulate; dorsal marginal carina weak, granular; dorsal secondary and external secondary carinae vestigial, smooth; digital carina weak, smooth; ventromedian carina moderate, granulose; ventrointernal carina weak to moderate, smooth; internal carinae weak, weakly granular.

Legs granular, tarsomere II spine formula 5/5:5/5:6/6:6/6.

Morphometrics.—Carapace wider than long; all metasomal segments longer than wide. Pedipalp chela length/depth 2.17; pedipalp chela width/depth 0.63; pedipalp chela length/pedipalp fixed finger length 2.42; pedipalp chela length/carapace length 1.79; carapace length/pedipalp fixed finger length 1.36; pedipalp fixed finger length/pedipalp femur length 0.89; pedipalp fixed finger length/metasomal segment V length 0.87.

Comparisons.—*Diplocentrus santiagoi* differs from *D. reddelli*, *D. maya*, *D. anophthalmus*, *D. coddingtoni*, *D. lucidus*, *D. ornatus*, and *D. steeleae* by its

larger size and higher number of setae on the genital operculi (seven pairs versus two to four pairs). It differs from the troglobitic *D. mitchelli* by its lower pedipalp chela length/depth (2.17 versus 3.68), lower pectinal tooth count (12 versus 17), and the presence of pigmentation, granulation and pedipalp chelal carinae. *Diplocentrus santiagoi* can be distinguished from *D. taibeli* by its lower pectinal tooth count (12 versus 15) and the presence of reticulate costae on all faces of the pedipalp chela. It can be distinguished from *D. lourencoi* by its higher pectinal tooth count (12 versus 9 to 10), and by the granulation on the carapace and telson (smooth to weakly granular in *D. santiagoi*, dense, coarsely granular in *D. lourencoi*).

Specimens examined.—Known only from the adult female holotype.

***Diplocentrus steeleae*, new species**

Figs. 43-51

Type data.—Holotype male from La Victoria, Chiapas, México, 29 December 1944 (T. C. Schneirla), deposited in the American Museum of Natural History, New York.

Etymology.—Named in honor of my good friend and colleague, June M. Steele.

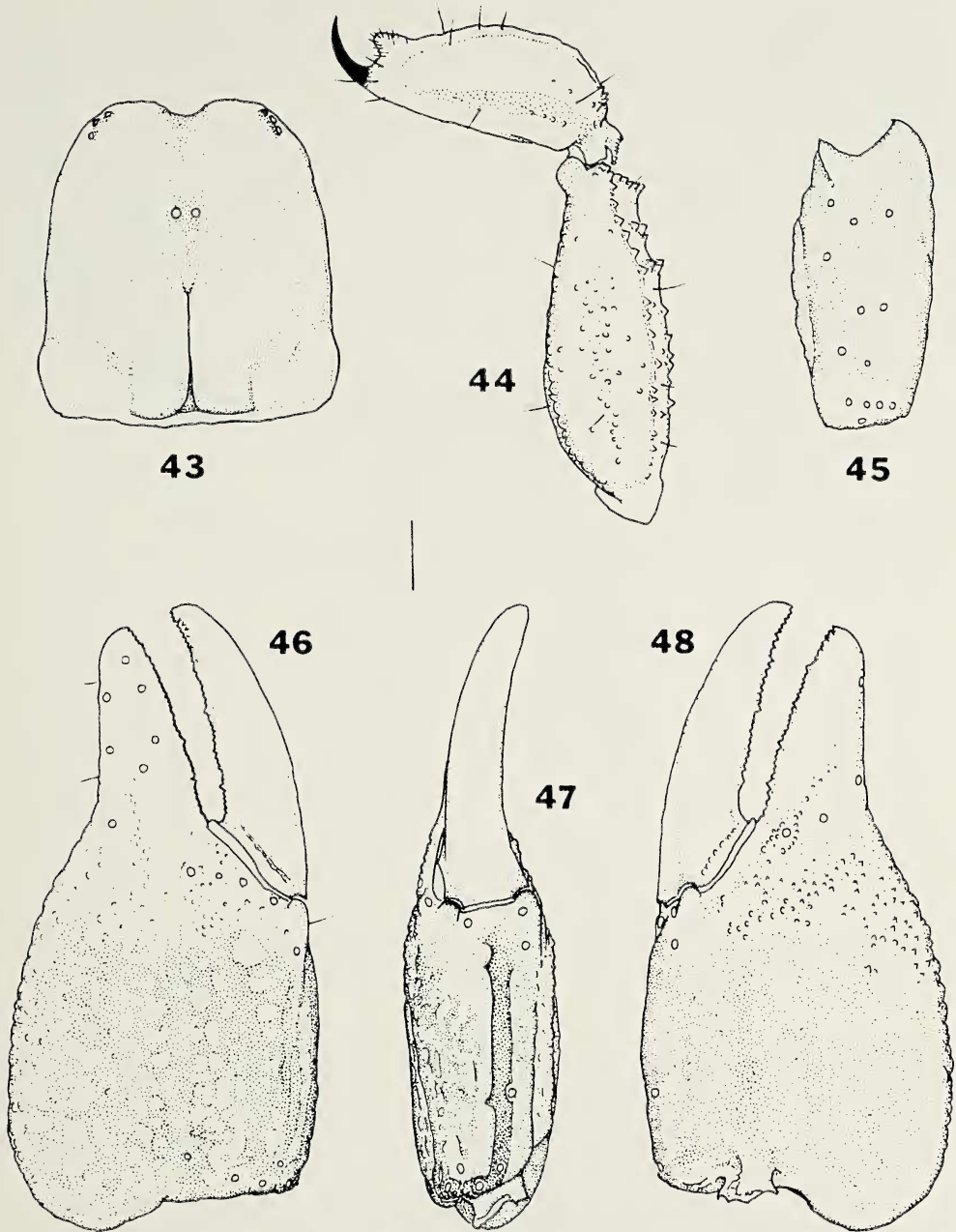
Distribution.—Known only from the type locality.

Diagnosis.—Yellowish- or reddish-brown scorpions; 25 mm in total length; carapace longer than wide, minutely granular; pectinal tooth counts 11 in males, females unknown; genital operculi with three or four pairs of setae; modal tarasomere II spine formula 4/4:4-5/5:5/5-6:6/6; males with moderately reticulate costate pattern on pedipalp; pedipalp chela length/depth 1.93; pedipalp chela width/depth 0.48.

Description.—*Male.* Color of body yellowish-brown without variable dark brown marbling (Fig. 43); pedipalps and metasoma reddish-brown. Carapace minutely granular, longer than wide; prosomal venter lustrous, punctate; pectinal tooth count 11. Genital operculi bearing three or four pairs of setae. Mesosomal tergites minutely granular; tergite VII not bilobate; submedian and lateral carinae weak, coarsely granular. Sternites smooth, lustrous; sternite VII with submedian and lateral carinae weak to vestigial, vestigially granular.

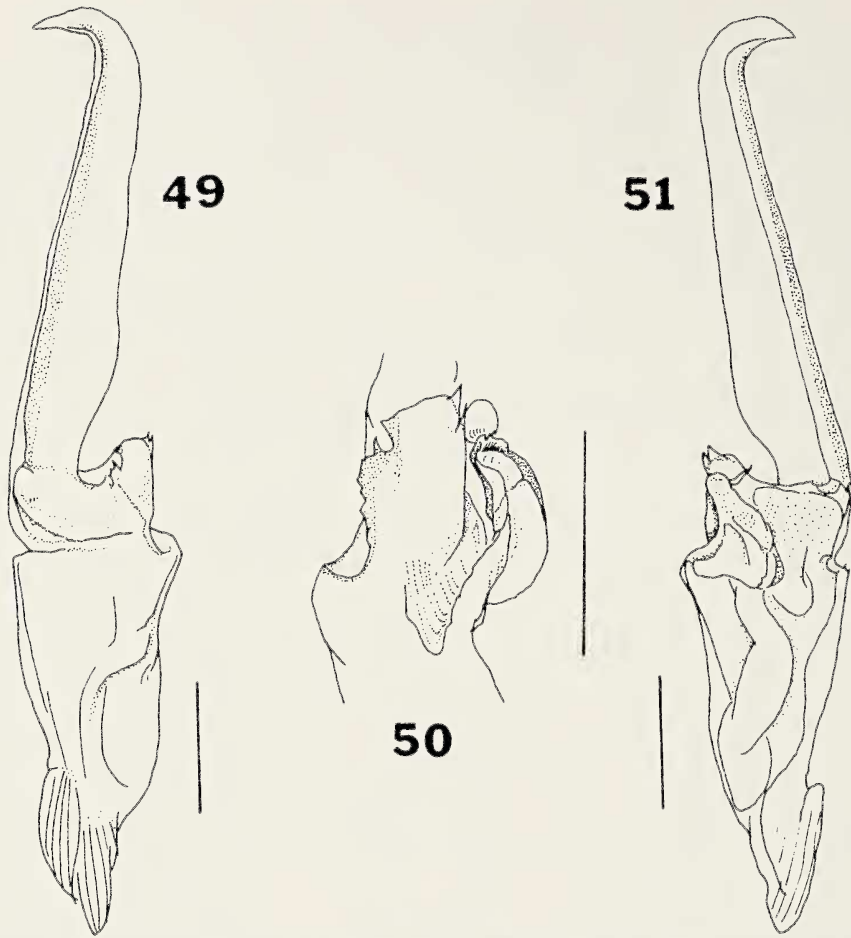
Metasoma intercarinal spaces minutely granular. Dorsolateral and lateral supramedian carinae moderate, granular on segments I-IV. Lateral inframedian carinae granular, moderately strong on segment I; weak on II and III; vestigial on IV. Ventrolateral carinae granulose, moderate on segments I and II; weak on III and IV. Ventral submedian carinae moderate to weak, granulose on segments I and II; weak, granulose on III; vestigial, granular on IV. Metasomal segment V (Fig. 44) dorsolateral carinae weak, granular; lateromedian carinae vestigial, granular; ventrolateral, ventromedian and ventral transverse carinae moderate, tuberculate; anal subterminal carina moderate, granulose; anal terminal carina obsolete. Telson (Fig. 44) granular ventrally and laterally; sparsely setose.

Pedipalps with orthobothriotaxy C (Vachon 1973). Femur with dorsal face minutely granular with a few larger granules; internal face coarsely granular; ventral and external faces minutely granular; dorsointernal carina weak to moderate, irregularly granular; dorsoexternal carina weak, irregularly granular;



Figs. 43-48.—*Diplocentrus steeleae*, new species, holotype male: 43, carapace; 44, metasomal segment V and telson, lateral aspect; 45-48, pedipalp; 45, patella, external aspect; 46, chela, external aspect; 47, chela, ventral aspect; 48, chela, internal aspect. Scale bars = 1 mm.

ventroexternal carina obsolete; ventrointernal carina weak to moderate, strongly granular. Patella (Fig. 45) with ventral and external faces weakly reticulate; internal face irregularly granular; basal tubercle moderate, with a few larger granules; dorsomedian carina moderate, reticulate; dorsoexternal, ventroexternal, and ventrointernal carinae weak to vestigial, reticulate. Chela (Figs. 46-48) with external face coarsely, moderately reticulate; internal face weakly reticulate to



Figs. 49-51.—*Diplocentrus steeleae*, new species, right hemispermatophore of holotype male: 49, dorsal aspect; 50, detail of capsular region, ectal aspect; 51, ventral aspect. Scale bars = 1 mm.

irregularly granular distally; dorsal marginal carina moderately strong, coarsely granular; dorsal secondary carina weak, smooth; digital carina moderate, smooth; external secondary carinae weak, reticulate; ventroexternal carina obsolete; ventromedian carina strong, reticulate; ventrointernal carina vestigial, smooth; internal carinae weak, reticulo-granular.

Legs minutely granular. Tarsomere II spine formula 4/4:4-5/5:5/5-6:6/6.

Hemispermatophore (Figs. 49-51) lamelliform; lateral external margin of median lobe armed with strong, sharp teeth; inner lobe with distal projection originating on the ventral margin.

Morphometrics.—Pedipalp chela of male laterally compressed. All metasomal segments longer than wide in male. Carapace longer than wide. Pedipalp chela length/depth 1.93; pedipalp chela width/depth 0.48; pedipalp chela length/pedipalp fixed finger length 2.63; pedipalp chela length/carapace length 1.77; carapace length/pedipalp fixed finger length 1.49; pedipalp fixed finger length/pedipalp femur length 0.82; pedipalp fixed finger length/metasomal segment V length 0.66.

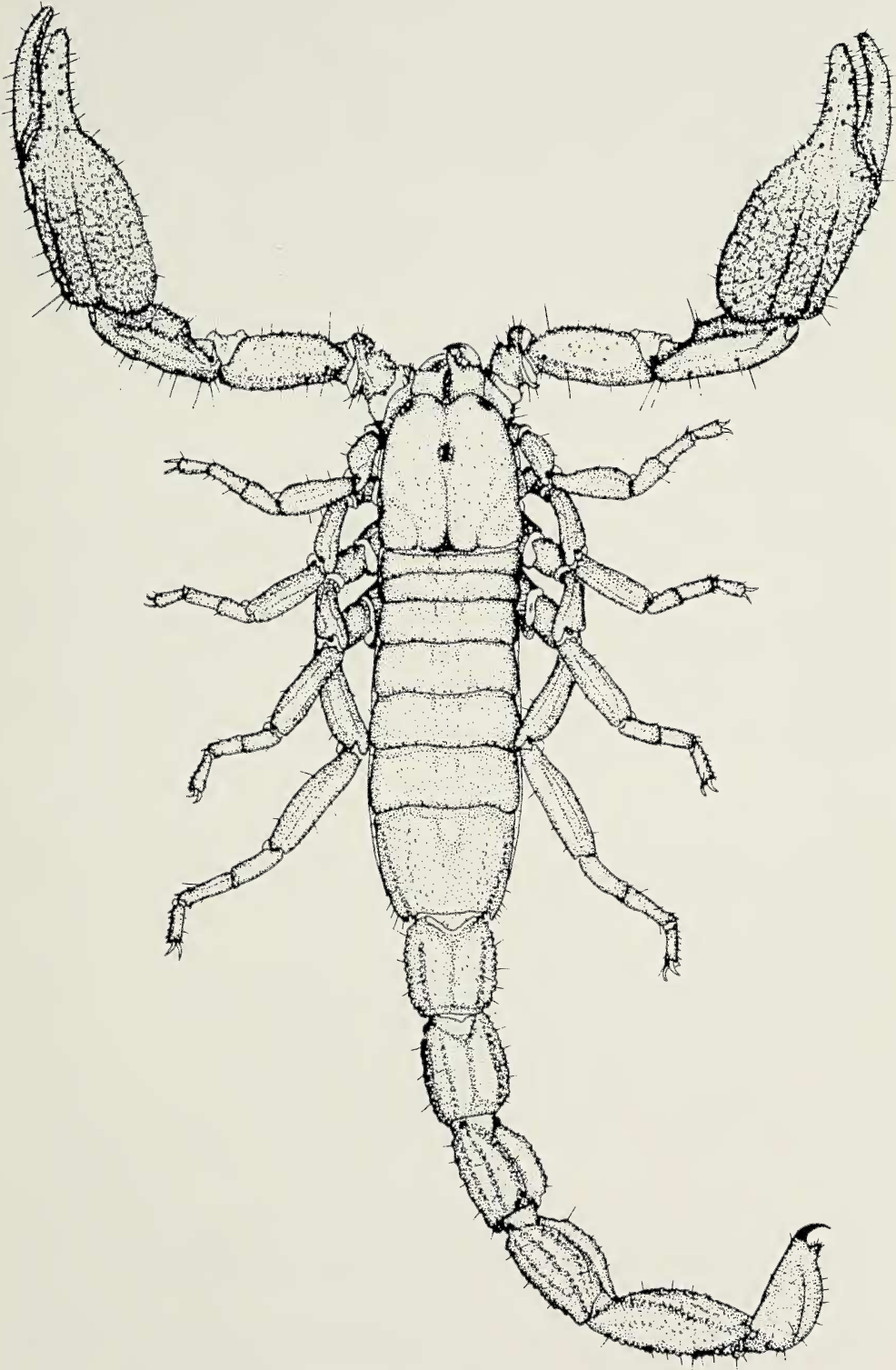


Fig. 52.—*Diplocentrus steeleae*, new species, holotype male, dorsal aspect.

Comparisons.—*Diplocentrus steeleae* can be distinguished from *D. taibeli*, *D. mitchelli*, *D. lourencoi*, and *D. santiagoi* by its smaller size and lower number of setae on the genital operculi (three to four pairs versus six to ten pairs). It differs from *D. reddelli*, *D. maya*, *D. coddingtoni*, and *D. lucidus* by its lower pedipalp chela width/depth (0.48 versus greater than 0.60) and its lack of dusky marbling on the carapace. *Diplocentrus steeleae* can be distinguished from *D. ornatus* by its lower pedipalp chela length/depth (1.93 versus 2.13-2.16), the position of the ventromedian carina of the pedipalp chela (directed between the movable finger condyles rather than towards the inner condyle), and by the presence of strong teeth on the lateral external margin of the median lobe of the hemispermatophore.

Specimens examined.—Known only from the holotype.

ACKNOWLEDGMENTS

I would like to thank Dr. N. I. Platnick of the American Museum of Natural History, Dr. C. Milkrit of the Field Museum of Natural History, Dr. J. Coddington of the U.S. National Museum, and Dr. J. Laerm of the University of Georgia, all of whom provided the specimens reported on herein. Thanks also to Dr. O. F. Francke and Dr. W. D. Sissom, who originally obtained the specimens and passed them on to me. I am also grateful to the following persons for their critical reviews of various drafts of this manuscript: Dr. W. D. Sissom, Dr. S. C. Williams, Dr. W. R. Lourenço, Dr. E. A. Maury, Dr. J. T. Doyen, Mr. J. A. Santiago-Blay, and Ms. J. M. Steele. Many of their comments are incorporated into this paper although not all of them agree with its contents.

LITERATURE CITED

- Caporiacco, L. di. 1938. Arachnidi del Messico, di Guatemala e Honduras Britannico. Atti Soc. Italiano Sci. Nat., Milano, 77:251-282.
- Francke, O. F. 1977a. Scorpions of the genus *Diplocentrus* Peters from Oaxaca, México. J. Arachnol., 4:145-200.
- Francke, O. F. 1977b. The genus *Diplocentrus* in the Yucatan Peninsula with description of two new troglobites (Scorpionida, Diplocentridae). Assoc. Mex. Cave Stud. Bull., 6:49-61.
- Francke, O. F. 1978. Systematic Revision of Diplocentrid Scorpions (Diplocentridae) from Circum-Caribbean Lands. Spec. Publ. Mus., Texas Tech Univ., No. 14, 92 pp.
- Francke, O. F. and S. A. Stockwell. 1987. Scorpions (Arachnida) from Costa Rica. Spec. Publ. Mus. Texas Tech Univ., No. 25, 64 pp.
- Kraepelin, K. 1905. Die Geographische Verbreitung der Skorpione. Zool. Jahrb., Syst., 22:321-364.
- Kraus, O. 1955. Escorpiones de El Salvador. Com. Inst. Trop. Inv. Cient. Univ. Nac. San Salvador, 4:101-104.
- Lamoral, B. H. 1979. The scorpions of Namibia (Arachnida: Scorpionida). Ann. Natal Mus., 23:497-784.
- Lourenço, W. R. 1983. Étude d'une petite collection de Scorpions du Nicaragua, avec la description d'une espèce nouvelle de *Centruroides* (Buthidae). Rev. Suisse Zool., 90:761-768.
- Peters, W. 1962. Ueber eine neue Eintheilung der Skorpione. Mon.-ber. Akad. Wiss. Berlin, (1862), pp. 507-513.
- Pocock, R. I. 1899. The Expedition to Sokotra III. Descriptions of the new species of Scorpions, Centipedes, and Millipedes. Bull. Liverpool Mus., 2:7-9.
- Schenkel, E. 1932. Notizen ueber einige Scorpione und Solifugen. Rev. Suisse Zool., 39:375-396.
- Simon, E. 1878. Descriptions de deux nouveaux genres de l'ordre des Scorpiones. Ann. Soc. Entomol. France, ser. 5, 8:399-400.

- Simon, E. 1880. Descriptions de genres et espèces de l'ordre des Scorpiones. Ann. Soc. Entomol. France, ser. 5, 10:377-398.
- Stahnke, H. L. 1968. Some Diplocentrid scorpions from Baja California del Sur, México. Proc. California Acad. Sci., ser 4, 35:273-320.
- Stahnke, H. L. 1970. Scorpion nomenclature and mensuration. Entomol. News, 81:297-316.
- Vachon, M. 1973. Étude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en Arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. Bull. Mus. Nat. Hist. Natur. Paris, ser. 3, No. 140 (Zool. 104):857-958.
- Williams, S. C. 1980. Scorpions of Baja California, Mexico, and adjacent islands. Occas. Papers California Acad. Sci., No. 135, 127 pp.
- Williams, S. C. and V. F. Lee. 1975. Diplocentrid scorpions from Baja California Sur, Mexico. Occas. Papers California Acad. Sci., 115:1-27.

Manuscript received July 1987, revised September 1987.